Problem I: A Safe Polynomial

Achilles' home. Achilles and the Tortoise are having a friendly chat over coffee.

Achilles: Mr. T, do you remember when you asked me if I could show you my collection of Escher lithographs? I could show them to you right now.

Tortoise: Oh, right! That would certainly make my day.

Achilles: Okay, give me a minute...

Achilles gets up and takes out a piece of paper from his wallet. Then types something into his computer. Almost immediately he walks to the fireplace and takes down a big portrait of M.C. Escher that is hanging from the mantlepiece, revealing a hidden safe. He enters a combination and the safe opens.

Tortoise: Wow, Achilles. I didn't know you had a hidden safe, I feel like I'm in a movie right now. And what was that you did with the computer a minute ago? Some ultra–secret method to open the safe?

Achilles: Heheh. Something like that. It's just that I keep forgetting the combination, so I have a mechanism to retrieve it again. Nothing sophisticated, though. Do you want to know how it works?

Tortoise: Yes, please. You have made me curious.

Achilles: I think you're going to like this. Take a look at the piece of paper I carry in my wallet.

Tortoise: Hmm... I see a bunch of words and numbers, but I don't understand their meaning.

Achilles: It works like this. There is a combination of four unique letters that open the safe, and if I forget it, I can get it back using the things you see in that paper. First, there is one *special* word, which contains the fours letters of the combination. Each letter is assigned a number: A is equal to 1, B is equal to 2, and so on... Z is equal to 26. Let's call the values of the four combination letters X, Y, Z and W. The numbers you see in the piece of paper are four coefficients (c_1, c_2, c_3, c_4), four exponents (e_1, e_2, e_3, e_4), and two numbers M and P. They form what I call the *safe polynomial*. The safe combination is formed by the four letters that make the following expression evaluate to true:

$$(c_1 X^{e_1} + c_2 Y^{e_2} + c_3 Z^{e_3} + c_4 W^{e_4}) \bmod M = P$$

Tortoise: You amaze me, Achilles. What an elegant solution... I feel proud of you.

Achilles: Thank you, Mr. T. You have been my inspiration. You're always using math for solving your every day problems, so I wanted to give it a try. Now, let me show you those Escher lithographs...

Write a program similar to the one Achilles uses to find out his combination. That is, given the values of the coefficients, exponents, M and P, and the special word used by Achilles, determine the combination of four letters that opens his safe. If there is more than one combination that satisfies the *safe polynomial*, choose the lexicographically greatest combination (the one that would appear last in a dictionary).

Input

Input starts with a positive integer **T**, that denotes the number of test cases. Each case is described in four lines. The first line contains a string **S**, that represents Achilles' special word. It only contains uppercase letters from the English alphabet, and all of its letters are distinct.

The second line contains two integers: **M** and **P**, in that order. The third line contains four integers: $\mathbf{c_1}$ to $\mathbf{c_4}$. The fourth line contains four integers: $\mathbf{e_1}$ to $\mathbf{e_4}$. You may assume that all test cases have a valid solution.

$T \leq 20$; $6 \leq \text{length}(S) \leq 15$; $100 \leq M \leq 10^9$; $0 \leq P \leq 10^9$; $1 \leq c_i \leq 10^9$; $0 \leq e_i \leq 10^{15}$

Output

For each test case, print the case number, followed by the four letters that open Achilles' safe.

Sample Input	Output for Sample Input
2 BRANCH 1003 730 2 3 5 7 1 2 3 4 RANDOMIZE 1000003 684189 10 20 30 40 42 33 24 15	Case 1: BACH Case 2: ZENO